(1) $5,491.63 is being invested today in an account earning an annual rate of 5.4%. To how much should the account accumulate after 7 years.

\[
\begin{array}{ll}
\text{PV} & -5,491.63 \\
\text{FV} & \ ? = 7935.71 \\
N & 7 \\
I & 5.4 \\
PMT & 0
\end{array}
\]

(2) You check an account balance and see that there is $21,570.44. The account has earned 5.2% per year for the past 4 years. What was the account balance four years ago?

\[
\begin{array}{ll}
\text{PV} & \ ? = -17,611.49 \\
\text{FV} & 21,570.44 \\
N & 4 \\
I & 5.2 \\
PMT & 0
\end{array}
\]

(3) Five years ago, you invested $2,600 in an account, and today the account balance is $3,972.11. What is the account's rate of interest?

\[
\begin{array}{ll}
\text{PV} & -2,600.00 \\
\text{FV} & 3,972.11 \\
N & 5 \\
I & \ ? = 8.845 \\
PMT & 0
\end{array}
\]

(4) How long does it take $2,305.12 to grow to $31,645.50 if it earns a 6.8% annual rate of interest?

\[
\begin{array}{ll}
\text{PV} & -2,305.12 \\
\text{FV} & 31,645.50 \\
N & \ ? = 39.8 \\
I & 6.8 \\
PMT & 0
\end{array}
\]
(5) $13,620.00 is being invested today in an account earning an annual rate of 9.5%. To how much should the account accumulate after 12 years.

\[
\begin{align*}
\text{PV} & : -13,620.00 \\
\text{FV} & : ? = 40,471.24 \\
N & : 12 \\
I & : 9.5 \\
PMT & : 0
\end{align*}
\]

(6) You check an account balance and see that there is $74,368.41. The account has earned 3.25% per year for the past 7 years. What was the account balance seven years ago?

\[
\begin{align*}
\text{PV} & : ? = -59,450.85 \\
\text{FV} & : 74,368.41 \\
N & : 7 \\
I & : 3.25 \\
PMT & : 0
\end{align*}
\]

(7) 25 years ago, you invested $12,000 in an account, and today the account balance is $182,630.56. What is the account's rate of interest?

\[
\begin{align*}
\text{PV} & : -12,000.00 \\
\text{FV} & : 182,630.56 \\
N & : 25 \\
I & : ? = 11.505 \\
PMT & : 0
\end{align*}
\]

(8) How long does it take $1,000 to grow to $1,000,000.00 if it earns a 10% annual rate of interest?

\[
\begin{align*}
\text{PV} & : -1,000.00 \\
\text{FV} & : 1,000,000.00 \\
N & : ? = 72.5 \\
I & : 10 \\
PMT & : 0
\end{align*}
\]

(9) You deposit $250 each year at year's end for 18 years. If the account earns 7.5%, to how much will the account grow after the final payment?

\[
\begin{align*}
\text{PV} & : 0 \\
\text{FV} & : ? = 8,919.35 \\
N & : 18 \\
I & : 7.5 \\
PMT & : 250
\end{align*}
\]
(10) You borrow $120,000 for production equipment and agree to make end of year repayments of the same amount for 7 years at 9.99% interest. If the loan is completely repaid after the final payment, then how much is each payment?

\[
\begin{align*}
\text{PV} & : -120,000 \\
\text{FV} & : 0 \\
\text{N} & : 7 \\
\text{I} & : 9.99 \\
\text{PMT} & : ? = 24,640.55
\end{align*}
\]

(11) You borrow $18,000 to purchase a car and agree to make six end of year payments of the same amount, $4,000, after which the car loan will be completely paid off. What interest rate is being charged on the loan?

\[
\begin{align*}
\text{PV} & : -18,000 \\
\text{FV} & : 0 \\
\text{N} & : 6 \\
\text{I} & : ? = 8.895 \\
\text{PMT} & : 4,000.00
\end{align*}
\]
(1) Twelve years ago, you invested $6,125.00 in an account, and today the account balance is $10,552.79. What is the account's rate of interest?

PV = $6,125.00
FV = $10,552.79
N = 12
I \ ? = 4.638
PMT = 0

(2) How long does it take $6,429.55 to grow to $12,111.11 if it earns a 8.1% annual rate of interest?

PV = $6,429.55
FV = $12,111.11
N \ ? = 8.13
I = 8.1
PMT = 0

(3) You deposit $1,500.16 each year at year's end for 9 years. If the account earns 8.2%, to how much will the account grow after the final payment?

PV = 0
FV \ ? = 18,890.48
N = 9
I = 8.2
PMT = $1,500.16

(4) $41,620 is being invested today in an account earning an annual rate of 3.5%. To how much should the account accumulate after 11 years.

PV = $41,620.00
FV \ ? = 60,763.94
N = 11
I = 3.5
PMT = 0
(5) You borrow $84,159 for production equipment and agree to make end of year repayments of the same amount for 6 years at 5.7% interest. If the loan is completely repaid after the final payment, then how much is each payment?

\[
\begin{align*}
\text{PV} & = -84,159 \\
\text{FV} & = 0 \\
\text{N} & = 6 \\
\text{I} & = 5.7 \\
\text{PMT} & = 16,953.810
\end{align*}
\]

(6) You check an account balance and see that there is $301,652.34. The account has earned 4.7% per year for the past 9 years. What was the account balance nine years ago?

\[
\begin{align*}
\text{PV} & = -199,520.06 \\
\text{FV} & = 301,652.34 \\
\text{N} & = 9 \\
\text{I} & = 4.7 \\
\text{PMT} & = 0
\end{align*}
\]

(7) You borrow $25,631 to purchase a car and agree to make five end of year payments of the same amount, $6,821.49, after which the car loan will be completely paid off. What interest rate is being charged on the loan?

\[
\begin{align*}
\text{PV} & = -25,631 \\
\text{FV} & = 0 \\
\text{N} & = 5 \\
\text{I} & = 10.347 \\
\text{PMT} & = 6,821.49
\end{align*}
\]
Solution to Problem 41
Capital budgeting

Bailey is considering starting a small catering business. She would need to purchase a delivery van and various equipment costing $125,000 to equip the. Rent expense for the building used by the business will be $35,000 per year. Bailey’s marketing studies indicate that the annual cash inflow from the business will amount to $120,000. In addition to the building rent, annual cash outflow for operating costs will amount to $40,000. Bailey wants to operate the catering business for only six years. She estimates that the equipment could be sold at that time for 4% of its original cost. Of course, working capital is released at the end of the project. Bailey uses a 16% discount rate.

**Required:** What is the net present value of the investment? What is the internal rate of return of the project? What is the payback period?

**Hint:** nothing is given for working capital, so it will be 0 in this solution.

**Net present value**

\[
\begin{align*}
\text{PV of inflows (return)} & \quad 167,865 \\
- \text{PV of investment} & \quad -125,000 \\
\text{Net present value} & \quad 42,865
\end{align*}
\]

\[
\begin{align*}
PV & \quad -167,865 \\
FV & \quad 5,000 \quad \text{salvage value of equipment 125,000 * .04} \\
N & \quad 6 \\
I & \quad 16 \quad \text{minimum required rate of return} \\
PMT & \quad 45,000 \quad \text{contribution margin = 120,000 - 35,000 - 40,000}
\end{align*}
\]

\[
\begin{align*}
\text{Internal rate of return} \\
PV & \quad -125,000 \quad \text{purchase cost of 125,000 plus training of 0 plus working capital of 0} \\
FV & \quad 5,000 \quad \text{salvage value of equipment} \\
N & \quad 6 \\
I & \quad ? = 28.12\% \\
Pmt & \quad 45,000 \quad \text{contribution margin}
\end{align*}
\]

**Payback period**

\[
N \times 45,000 = 125,000 \\
N = 2.8 \text{ years}
\]
In the following table, the net of tax cash flows are in yellow, and the final answer for NPV and for IRR are in blue.

<table>
<thead>
<tr>
<th>year</th>
<th>CM</th>
<th>Maint</th>
<th>Pre-tax Margin</th>
<th>NetOfTax Margin</th>
<th>TaxBreak</th>
<th>Deprec</th>
<th>Equip (8,000,000)</th>
<th>Training (1,200,000)*.75</th>
<th>Recover (800,000)</th>
<th>Total CF (9,700,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2,000,000</td>
<td>300,000</td>
<td>1,700,000</td>
<td>1,275,000</td>
<td>400,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1675000</td>
</tr>
<tr>
<td>1</td>
<td>6,000,000</td>
<td>100,000</td>
<td>5,900,000</td>
<td>4,425,000</td>
<td>640,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5065000</td>
</tr>
<tr>
<td>2</td>
<td>5,000,000</td>
<td>200,000</td>
<td>4,800,000</td>
<td>3,600,000</td>
<td>384,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3984000</td>
</tr>
<tr>
<td>3</td>
<td>4,000,000</td>
<td>250,000</td>
<td>3,750,000</td>
<td>2,812,500</td>
<td>230,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3042900</td>
</tr>
<tr>
<td>4</td>
<td>3,000,000</td>
<td>300,000</td>
<td>2,700,000</td>
<td>2,025,000</td>
<td>230,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2255400</td>
</tr>
<tr>
<td>5</td>
<td>1,000,000</td>
<td>300,000</td>
<td>700,000</td>
<td>525,000</td>
<td>115,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200,000*.75 1590200</td>
</tr>
</tbody>
</table>

PV CF In 10% 13078310
Invest -9700000
Solution--> NPV@10% 3378310
Solution--> IRR 21.8232%
## Solution to Problem 43

### Capital budgeting

<table>
<thead>
<tr>
<th>Year</th>
<th>CM</th>
<th>Maint</th>
<th>Pre-tax Margin</th>
<th>NetOfTax Margin</th>
<th>TaxBreak Deprec</th>
<th>Equip (5,000,000)</th>
<th>Training (1,500,000)*.75</th>
<th>Recover WCap (500,000)</th>
<th>Total CF (6,625,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,000,000</td>
<td>300,000</td>
<td>700,000</td>
<td>525,000</td>
<td>250,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4,000,000</td>
<td>200,000</td>
<td>3,800,000</td>
<td>2,850,000</td>
<td>400,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3,500,000</td>
<td>250,000</td>
<td>3,250,000</td>
<td>2,437,500</td>
<td>240,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3,000,000</td>
<td>300,000</td>
<td>2,700,000</td>
<td>2,025,000</td>
<td>144,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2,500,000</td>
<td>350,000</td>
<td>2,150,000</td>
<td>1,612,500</td>
<td>144,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2,000,000</td>
<td>400,000</td>
<td>1,600,000</td>
<td>1,200,000</td>
<td>72,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1,000,000</td>
<td>400,000</td>
<td>600,000</td>
<td>450,000</td>
<td>0</td>
<td>300,000*.75</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PV CF In 11%** 9,010,933 
**Invest** (6,625,000) 
**Solution--> NPV@11%** 2,385,933 
**Solution--> IRR** 21.8558%